

DEC STD 015-0 Abbreviations and Units of Measurement

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ABSTRACT: This standard requires the use of SI (metric) units of measurement and unit symbols for all quantities by all Digital personnel who produce or procure documentation, including drawings, manuals, and advertising for commerce in the European Economic Community (EEC). The use of dual units is allowed. This standard also provides abbreviations for use on engineering drawings and recommended for use in all documents. Conversion factors for U.S. customary units are provided.

APPLICABILITY: Mandatory for all organizations within Digital Equipment Corporation that produce or procure documentation, including drawings, manuals, and advertising for commerce, in the European Economic Community (EEC). The standard is recommended for Digital use worldwide.

STATUS: APPROVED 08-Apr-1991; use VTX SMC for current status.

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CONTENTS

1 INTRODUCTION	1
1.1 PURPOSE	1
1.2 SCOPE	1
1.2.1 Non-Goals	1
1.3 RESPONSIBILITIES	1
1.3.1 Creators of Documents and Products	1
1.4 INTERNATIONALIZATION	2
2 REQUIREMENTS	2
2.1 USE OF ABBREVIATIONS	2
2.1.1 Clarity	2
2.1.2 Punctuation	2
2.1.3 Forms	2
2.1.4 Exceptions for Limited Character Sets	3
2.1.5 Identifiers and Lettering Outside the Scope of This Standard	3
2.1.6 U.S. Postal Codes for States	3
2.1.7 Country Names	4
2.2 UNITS AND UNIT SYMBOLS	4
2.2.1 EEC Requirements	4
2.2.2 Other Countries	4
2.2.3 Metric Components Not Required	4
2.2.4 Software Commands	5
2.2.5 Dual Units for U.S. and EEC Products	5
2.2.6 Precision of Converted Units	5
2.2.7 Use of Unit Symbols	6
2.2.8 Unit Symbols in Lowercase	6
2.2.9 Roman Type vs Italic Type	6
2.2.10 Minimum Letter Size for Microfilming	7
2.2.11 How to Form Compound Unit Symbols	7
2.2.12 Compound Unit Symbols Involving Division	7
2.2.13 Prefixes for Decimal Multiples and Submultiples	8
2.2.14 Choosing Multipliers	9
2.2.15 Binary Multiples	9
2.2.16 Use of Unit Symbols with Numbers	10
2.2.17 Use of the Term Bytes	11
2.2.18 Raising a Prefix to a Power	11
2.2.19 Preferred Spellings	11
2.2.20 Mass	11
2.2.21 Values Less Than 1	12
2.2.22 Trade Sizes or Nominal Sizes	12
2.2.23 Required Labeling	13
2.2.24 Typesetting	13
2.2.25 Modifiers to Unit Symbols	13
3 LIST OF ABBREVIATIONS	14

3.1 GENERAL ABBREVIATIONS	15
3.2 BITS AND BYTES	15
3.3 FABRICATION AND MATERIAL ABBREVIATIONS	26
Appendix A INTERNATIONAL LABELING REQUIREMENTS	35
Appendix B OJ NO. L 357/28 7.12.89 89/617/EEC OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES, COUNCIL DIRECTIVE OF 27 NOVEMBER 1989 AMENDING DIRECTIVE 80/181/EEC, PORTIONS OF THE DIRECTIVE AS AMENDED	37
Appendix C REFERENCED DOCUMENTS	41
C.1 EL-Class Digital Documents	41
C.2 Other Digital Documents	41
C.3 Other Documents	41
C.4 Ordering Information	42
TABLES	
1 Prefixes Used to Indicate Decimal Multiples or Submultiples of Units	8
2 Obsolete Prefix Usage	8
3 Abbreviations and Unit Symbols for General Use	16
4 Internal Use Abbreviations for Mechanical Specifications	26

1 INTRODUCTION

1.1 PURPOSE

The purpose of this standard is to define and facilitate the use of a uniform and consistent set of abbreviations and unit symbols throughout Digital. This standard also requires that all parts of Digital that produce or procure documentation for commerce in the European Economic Community (EEC) use SI (metric) units of measurement and unit symbols for all quantities. SI is the designation of Le Système International d'Unités, the international metric system.

The U.S. is the only major country that does not use or has not committed to use SI units.

1.2 SCOPE

The abbreviations and units of measurement listed in this document are to be used for drawings, manuals, print sets, and all other documents, except when a specialized market requires a different set of abbreviations or units.

The abbreviations under subhead 3.2 are to be used only on fabrication drawings, not on documents visible to customers, salespersons, or customer service people.

Abbreviations for common words are not covered in this standard. For abbreviations of English words and phrases not included in this standard, refer to *Concise Oxford Dictionary*, *Webster's Third New International Dictionary*, or *Webster's New World Dictionary*.

1.2.1 Non-Goals

This standard does not define precisely what the value or meaning of particular units of measure or the precise methodology of establishing the relative values of two related units. It does not list all units that might conceivably be encountered in all fields of application. See the referenced external standards for considerably more detail on these issues, or consult the owner of this standard for additional information.

Because the users of this standard are not expected to be experts in any of the fields of measurement for which the unit symbols are used, the table of abbreviations and unit symbols is organized alphabetically rather than by field of use.

1.3 RESPONSIBILITIES

1.3.1 Creators of Documents and Products

All individuals within Digital who write, draw, or otherwise produce documents, brochures, and drawings are responsible for using abbreviations and unit symbols in accordance with this document.

All individuals who design products (hardware or software) that use unit symbols shall use, at least, the appropriate SI unit symbols to the extent that such use is technically feasible and acceptable in the market place.

Where the intended market for a particular product requires different abbreviations and unit symbols, the product manager or designate shall provide persons creating this product and its documents with a list (preferably a recognized standard) of abbreviations and unit symbols to be used with the product. Because most of Digital's products go into

diverse markets, the use of abbreviations different from those in this standard should be infrequent.

1.4 INTERNATIONALIZATION

The abbreviations and non-metric unit symbols in this standard are, in general, usable in English only. For example, an inch (in.) becomes a *pouce* in French. Translation is necessary when used in the context of another language. Consult with the International Engineering Development (IED) Team for assistance with translations. The use of non-linguistic symbols, as described in *DEC STD 178-5 Marking Symbolology*, is recommended on products.

The metric [SI] unit symbols are correct in all languages. However, the required Roman and Greek characters may not be available in some circumstances—for example, in Chinese, Cyrillic (Russian), or Thai printing houses. Consult the IED Team for advice when the necessary characters are not available.

2 REQUIREMENTS

2.1 USE OF ABBREVIATIONS

2.1.1 Clarity

Use abbreviations and unit symbols only when their meaning will be unquestionably clear to the intended reader. *When in doubt, spell it out.*

When an abbreviation or unit symbol is used that is not standardized or is not likely to be familiar to the reader, spell it out the first time it is used. For example, kilobits per second (kb/s).

2.1.2 Punctuation

Do not use a period (full stop) with an abbreviation or unit symbol unless shown as part of the abbreviation.

For example:

SI	<i>not</i> S.I.
s	<i>not</i> sec.
a	<i>not</i> amp.

2.1.3 Forms

Use the same abbreviation for singular and plural forms.

For example:

1 kg	300 kg
1 mm	25 mm

2.1.4 Exceptions for Limited Character Sets

In some circumstances (primarily data-processing generated lists and other line printer output) the lowercase letters and Greek letters required by this standard are not available. In these instances, the use of the alternate symbols in column LPT of the General Abbreviations table under subhead 3.1 is allowed.

Where Greek characters, the DEC Multinational Character Set, or the ISO Latin Alphabet No. 1 character set are not available, but lowercase letters are available, the use of "u" instead of "µ" is allowed. Such use should be held to a minimum.

However, it is recognized that line printer output may have to express numbers as $3.14 \times 10^{*(-5)}$, $3.14 \times 10^{(-5)}$, or 3.14 E-5 instead of $3.14 \cdot 10^{-5}$.

2.1.5 Identifiers and Lettering Outside the Scope of This Standard

The mnemonic letter strings used as drawing identifiers and signal name prefixes on some drawings are beyond the scope of this standard. The consistent use of such strings from one generation of equipment to the next is recommended.

The drawing type identifiers used as part of drawing numbers is covered by *DEC STD 012-1 Document Identification Conventions Including Mnemonic Codes*.

The lettering contained within a schematic symbol is part of the symbol and is beyond the scope of this standard. The component designations used in circuit schematics (for example, R1, C12, E23) are beyond the scope of this standard. See EL-SM056-00, *Logic Symbology Manual*, and in particular, *DEC STD 056-3 Symbology - Discrete Electronic and Electromechanical Component Symbols* and ANSI Y32.16/IEEE Standard 200, *Reference Designations for Electrical and Electronic Parts and Equipment*, which are included in that manual, for further information.

See *DEC STD 178-5 Marking Symbology* for graphic symbols to be used instead of words on products and packaging.

2.1.6 U.S. Postal Codes for States

The use of the 2-letter postal codes for states in U.S. addresses is a measure devised by the U.S. Postal Service to allow bulk mailers to use a 3-line address with 22 characters per line and provide space for a 5-digit ZIP code. Two-letter state codes are confusing to most people, especially outside of the U.S. For example: Is AL Alabama or Alaska?; Is MA Massachusetts or Maine?; Is MI Michigan or Minnesota?; What is the postal state code for Hawaii?; For Ontario?

For bulk mail applications, consult the regulations of the country of mailing. In all non-bulk mail applications, the state should be abbreviated in the old "standard" way or spelled out. For mailing list maintenance, the U.S. Postal Service also publishes, in the *National ZIP Code and Post Office Directory*, a list of shortened U.S. place names that should be used to uniformly shorten these names when required for mailing list usage. For a list of old "standard" U.S. state abbreviations, see most U.S. dictionaries.

See the *Company Identity Manual*, no part number, for information on styles of addresses in various circumstances.

2.1.7 Country Names

This standard recommends that the abbreviation for a place name be that used in the place itself. For example, U.S. or USA would always be used for the United States of America and not EE. UU. (as in Spanish). Comprehension by the reader should, when necessary, override this recommendation.

2.2 UNITS AND UNIT SYMBOLS

2.2.1 EEC Requirements

Council of the European Communities Directive 80/181/EEC (referred to in this standard as "the directive") effective 1 October 1981 as amended by Directive 85/1/EEC and Directive 89/617/EEC requires the use of SI units and certain acceptable alternative units as indicated below.

In order to comply with the directive, this Digital standard requires that all documents that may enter commerce in the EEC use SI units, unit symbols, unit symbol multiplier prefixes, and prefix symbols as listed in this standard. EEC-acceptable alternatives as listed under subhead 3 may also be used.

There is not a requirement to eliminate non-SI units in dual-dimensioning until at least 1999.

These requirements apply to product labeling, packaging labeling, field maintenance print sets, installation data, user and maintenance manuals, brochures, and catalogs for both hardware and software. In particular, all unit assembly drawings shall comply with this requirement.

These requirements also apply to products and documents procured from a vendor (for example, those supplied with a piece of vendor equipment).

Selected portions of the directive as amended are provided as Appendix B.

2.2.2 Other Countries

In general, SI units must be provided on products and documents for use in any country except the U.S. SI units may be provided on products and documents in the U.S. Several countries require dual dimensions in inch and SI units. See Appendix A for further information.

2.2.3 Metric Components Not Required

This standard does not require the use of metric fasteners or metric sheet metal gages or that other product features be designed to metric standards.

However, see *DEC STD 002-0 AC Power Wiring, Safety Earth Grounding, Plugs and Receptacle Information and Requirements* for required screw sizes for interchangeability of removable hardware for safety earth ground connections.

2.2.4 Software Commands

This standard does not require that the input, output, or command structure of programs use SI units. However, the documentation that describes programs must include SI units. For example, a software manual might state "To set the recording density of the tape to 63 rows/mm (1600 bits/in) type:

SET DENSITY: 1600"

2.2.5 Dual Units for U.S. and EEC Products

If a document or product will also be used in the U.S. as well as Europe (the usual case) and if the customary U.S. unit of measurement is not the SI unit or an EEC-acceptable alternative, then the U.S. unit should be stated in addition to the SI unit.

In a few cases, the SI unit is not the customary unit in some metric system countries either. In these cases, both the U.S. and the non-SI metric units should be stated in addition to the SI unit.

The SI unit should precede the customary unit(s) when two or more units are shown. On drawings, the SI unit should go above the customary unit, as detailed in *DEC STD 114-1 Engineering Drawing Requirements - Dimensioning and Tolerancing for Engineering Drawings*. For example, "Adjust the brake so that a force of 15 N (3.4 lbf, 1.5 kgf) is required to turn the reel." Dual (or triple) units shall not be used if confusion might result.

There is no requirement in the EEC at the present time that American ("English") units not be shown in addition to metric units in most cases. The EEC may require the use of metric [SI] units alone (without dual units) after 1999. *DEC STD 178-4 Shipping Container Marking Requirements* requires that shipping container dimensions be labeled in metric [SI] only to comply with international shipping requirements.

2.2.6 Precision of Converted Units

When conversion of units is necessary, the precision of the converted measurement shall reflect the precision of the original measurement. For example, a cable stated to be 10 feet long should be converted to 3 metres long; whereas, a metal part stated to be 10.00 feet long should be converted to 3.05 metres long. See ANSI/IEEE 268-1982 *Metric Practice* for rules for maintaining precision when converting units.

Two parts that are intended to "fit" together shall "fit" together regardless of whether either part was built to metric or non-metric dimensions. This shall be true regardless of whether the "fit" is in mechanical dimensions (for example, hole sizes), weight-bearing capacity, light intensity, or whatever.

For example, a hole in a part dimensioned as 0.75 ± 0.05 inches might be converted to metric as 19.0 ± 1.3 millimetres and the minimum size of the hole in this case is 17.700 millimetres and the maximum size of the hole is 0.80 inches (= 20.320 millimetres). The maximum size part that will fit into any copy of this hole (with no clearance) is 17.700 mm = 0.69685 inch in diameter rather than 0.7000 inch as might be expected. This example ignores circularity, perpendicularity, and clearance for assembly, which must be taken into account for real parts.

The details of tolerance are specific to the application. See, for example, DEC STD 114-1 for mechanical tolerances.

2.2.7 Use of Unit Symbols

The unit symbols in the GEN column of Table 3 under subhead 3 for physical quantities, multiplier prefixes, and unit symbols are for general use in all drawings, publications, and panel markings. These symbols are in accordance with ANSI/IEEE Standard 260-1978, *IEEE Standard Letter Symbols for Units of Measurement* and are consistent with ISO 1000, *SI units and recommendations for use of their multiples and certain other units* and IEC 27 (1983-1989) *Letter symbols to be used in electrical technology*.

2.2.8 Unit Symbols in Lowercase

Unit names are always in lowercase unless they start a sentence. Unit symbols are in lowercase, except for the first letter of a symbol when the name of the unit is derived from a proper name.

For example:

m	metre
W	watt
Pa	Pascal

The distinction between upper and lowercase letters shown in the table under subhead 3.1 must be followed, even if the symbol appears in applications where other lettering is in uppercase style. For example,

MOVE THE LEVER 20 mm FROM THE END OF TRAVEL
MAINTAIN A CLEARANCE OF 2 mm MINIMUM, 2.7 mm MAXIMUM

The use of "L" for litre is allowed as a special case, because the lower case "l" is easily mistaken for the numeral "1" in many type fonts. The symbol for litre is only given as "L" in some standards.

2.2.9 Roman Type vs Italic Type

Quantity Symbols ordinarily use italic type whereas Unit Symbols ordinarily use Roman (upright) type.

For example:

"The electric potential, *U*, observed on the power line was 120 volts, 120 V. (where the V for volts is not italic.)"

In common text, where precision (or pedantry) is unnecessary, Quantity Symbols are also done in Roman.

Currently, there are no quantity symbols in DEC STD 015-0, and they are rarely used in our publications.

Unit symbols should be printed in upright (Roman) type regardless of the type style in surrounding text.

For example: ... *a distance of* 56 km *between* ...

2.2.10 Minimum Letter Size for Microfilming

Certain minimum dimensions of lettering must be maintained on drawings to be microfilmed. To meet the minimum dimension requirements, the use of lowercase letters that are nearly as large as uppercase letters and/or the use of larger-than-normal lettering is recommended. See *DEC STD 182-0 Engineering Documentation Acceptance Criteria* for more information on microfilm formats.

2.2.11 How to Form Compound Unit Symbols

When a compound is formed by multiplication of two or more units, its symbol consists of the symbols for the separate units joined by a raised dot (a dot raised above the baseline of the letters). The dot may be omitted in the case of familiar compounds where no confusion would result or when exponents separate the symbols. Hyphens should not be used in symbols for compound units unless raised dots are not available or are otherwise unusable (for example, on ozalid-reproduced drawings). Care should be taken that when hyphens are used, they are not confused with minus signs. One way to avoid confusion is to put parentheses around the hyphenated units.

For example:

N·m	newton metre
Wh	watt hour
N·m ² kg ⁻²	newton metre ² /kilogram ²
m/(kg·s)	metres per kilogram second

The size or exact location of the raised dot is not specified except that it shall be clearly different than a period or a decimal point.

2.2.12 Compound Unit Symbols Involving Division

When a compound unit is formed by division of one unit by another, its symbol consists of the symbols for the separate units either separated by a solidus (/) or multiplied by using negative powers. In no case shall more than one solidus appear in the same unit expression nor shall a multiplication occur after a solidus unless parentheses are used to eliminate ambiguity.

For example:

m/s	metres per second
m·s ⁻¹	metres per second
m/(kg·s)	metres per kilogram second
m·(kg·s) ⁻¹	metres per kilogram second

22 m/s velocity causes a pressure gradient of 17 Pa/m

not m/s/kg (ambiguous)

NOT m/kg·s (ambiguous)

Do not use "p" for "per". For example, rpm, lpm, bpi, bps are not allowed. The use of "/" for "per" is permitted, but not recommended, on mechanical drawings for use in the U.S. only.

2.2.13 Prefixes for Decimal Multiples and Submultiples

Table 1 lists prefixes used to indicate decimal multiples or submultiples of units.

Table 1: Prefixes Used to Indicate Decimal Multiples or Submultiples of Units

Multiple	Prefix	Symbol	Line Printer Use
10^{18}	exa	E	none
10^{15}	peta	P	none
10^{12}	tera	T	T
10^9	giga	G	G
10^6	mega	M	M
10^3	kilo	k‡	K
10^2	(hecto) †	(h)	
10	(deka) †	(da)	
10^{-1}	(deci) †	(d)	D
10^{-2}	centi†	c	C
10^{-3}	milli	m	MIL
10^{-6}	micro	μ	U
10^{-9}	nano	n	N
10^{-12}	pico	p	P
10^{-15}	femto	f	F
10^{-18}	atto	a	A

†The prefixes hecto, deka, and deci should not be used in Digital publications. The only common exception is the use of dB for decibel. The prefix centi for 10^{-2} should be used only in certain combinations, most notably cm for centimetre. Use 10^{-3} or the base unit instead.

‡International standards require the use of a lowercase k for kilo (1000). However, the use of capital K causes no confusion and is permitted in this standard in the rare case the provisions of subhead 2.2.1 do not apply. It is recommended that the capital K only be used for the multiplier 1024.

If values outside the ranges in Table 1 are required, they should be expressed with powers of 10. Compound prefixes shall not be used. See Table 2.

Table 2: Obsolete Prefix Usage

Use	Do Not Use
tera T	mega mega MM
giga G	kilo mega kM
nano n	millimicro mμ
pico p	micro micro μμ

NOTE

The use of upper and lowercase letters as shown above is required, except as noted in subhead 2.1.4.

NOTE

The use of prefixes involving "M" outside of engineering and science fields should be undertaken with caution. "M" has been used to mean numerous things:

M	million	10^{+6}	American, French
M	milliard	10^{+9}	British, German
M	thousand	10^{+3}	Roman numerals, printing
M	milli	10^{-3}	Old electronics, such as MA
M	micro	10^{-6}	Old electronics, such as MFD
m	meter	unit	
MM	micro micro	10^{-12}	Old electronics, such as MMFD
mm	millimetre	10^{-3} m	
M/M	millimetre	10^{-3} m	
m/m	millimetre	10^{-3} m	
m/m	metre/metre		Legitimate for slope measurements, and so on.

2.2.14 Choosing Multipliers

In tables, all entries in a particular column should have the same unit and multiplier. If the range is more than 10 000:1, the use of exponential notation is recommended.

In all other applications, the multiplier prefix should be chosen so that the value is between 1 and 999.99... units. For example, 10 nF rather than 0.01 μ F.

2.2.15 Binary Multiples

The use of K for 1024 (2^{10}), a *binary thousand* or of M for 1 048 576 (2^{20}), a *binary million* is not recommended by any of the recognized standards, but is acceptable when referring to main memory size.

The use of G for 1 073 741 824 (2^{30}), a *binary billion* is not yet needed in any known context. Disks, though roughly of this size, are never exactly 2^{30} bytes capacity (formatted or unformatted). However, main memory of this size will probably be available soon.

K as a *binary thousand* or M as a *binary million* is treated as a modifier of the numeric value rather than a multiplier of the unit symbol. In many cases the disk sizes or picture sizes given are approximate but the exact sizes are not usually a power of 2.

For example:

a 256K-byte memory module ($256 \times 1024 = 262\,144$ bytes)

4M-bit memory chips ($4 \times 1\,048\,576 = 4\,194\,304$ bits)

a 320-MB (or megabyte) disk (320 000 000 bytes) which might actually be 512 byte sectors (blocks) $\times$ 58 sectors $\times$ 980 tracks $\times$ 11 (data) surfaces = 320 122 880 (data) bytes

a reduced resolution 200-kb (or kilobit) picture

Here is another way of dealing with large binary addresses:

"The VAX-11/780 addresses 256K pages of 512 quadwords of 8 bytes of 8 bits."

2.2.16 Use of Unit Symbols with Numbers

A space shall be used between a number and a unit symbol, except when a degree sign is used, as for degrees, minutes, and seconds of angle, degrees celsius and degrees fahrenheit, and except for the format noted at "hours" in Table 3.

For example:

27°C	<i>not</i> 27 °C or 27° C
300 K	<i>not</i> 300K (temperature)
35 mm	<i>not</i> 35mm
37° 15'	
32"	
256K bytes	<i>not</i> 256 Kbytes, when K = 1024
56 kb/s	where k = 1000
4M bits	<i>not</i> 4 Mbits, when M = 1 048 576
320 MB	when M = 1 000 000
9%	Because % is not a unit symbol

"For proper operation, a module with 256K bytes of superconducting memory must be cooled to a temperature of 5 K (-268°C)."

A period or a comma or a stylized figure (for example, a small solid square) may be used as a decimal point.

period: commonly used in English language publications

comma: commonly used in non-English language publications

square: a compromise decimal point when necessary

NOTE

Some organizations consistently use a comma as a decimal point in all languages (including English). Some publications (inconsistently) use both period and comma for a decimal point in different articles (and advertisements) on the same page.

In English text, the common practice is to use a period on the line. In non-English text, the common practice is to use a comma on the line. Variations to both practices can be found.

For example:

15°C
125 kWh
37 ns
3.141 59 kg · m/s²
1024.00 m (common English decimal point)
35 157,034 57 Hz (common non-English decimal point)
5 041,762 10 (compromise decimal point)

Use a space or half space instead of a period or a comma to separate each three digits of a number. A space is usually not necessary in 4-digit numbers. For example, 1018.

In typesetting, where variable width spaces are used to justify lines, the space or half space within a number should be a non-expandable or hard space.

2.2.17 Use of the Term Bytes

A byte is not always eight bits in length. In the DECsystem-10 and DECSYSTEM-20 family, a byte is commonly 6, 7, 8, or 9 bits, but may be from 1 to 36 bits. A byte is not always a character; there are situations where 6 characters are stored as 32 bits (for example, "RADIX50" or "SQUOZE"). In some languages, such as Chinese, two or three bytes are needed to define a single character. See *DEC STD 169-0 DEC Standard Coded Character Sets for Hardware and Software*. In a number of cases the byte is not the most relevant measure: the DECsystem-10™ and DECSYSTEM-20™ actually have memory that is 36 bits wide (plus bits used for error correction or parity).

The VAX-11/780 has writable microcode memory that is 96 bits wide by 1024 words long. This was called 12 Kbytes in some Digital sales literature, but the concept of bytes is meaningless in this context.

Sizes should be quoted in meaningful units. For PDP-11 and VAX main memory and on 9-track magnetic tape, these are 8-bit bytes. In other instances, the meaningful units may be words (of specified size), characters, or bits.

2.2.18 Raising a Prefix to a Power

When a prefix and a unit symbol are combined and then raised to a power, the exponent applies to both the unit symbol and the prefix, but not the number.

For example:

$$\begin{array}{ll} 4 \text{ km}^2 = 4\,000\,000 \text{ m}^2 & \text{not } 4000 \text{ m}^2 \\ 1 \text{ mm}^2/\text{s} = 10^{-6} \text{ m}^2/\text{s} & \text{not } 10^{-3} \text{ m}^2/\text{s} \end{array}$$

2.2.19 Preferred Spellings

The preferred spellings of the SI unit of length, metre or meter, and the special name of the submultiple of the unit of volume, liter or litre, are not specified in the directive. The directive itself consistently uses "metre" and "litre". Various countries customarily use one spelling. There is not yet any consensus in the U.S. as to which spelling is preferred. This standard uses both spellings interchangeably, but leans toward the spelling "metre" to avoid confusion with a measuring device "meter".

This document does not address the other differences between U.S. and UK spelling (color, colour; gage, gauge, and so on) nor the terminology needed for clear communication throughout the world (ac line versus mains versus power mains). A multi-dialect (such as British-American) technical dictionary is recommended for this purpose. If enough demand exists, such a dictionary could be adopted as a future section of this standard.

2.2.20 Mass

Although the SI unit of mass (weight) is the kilogram (kg), multiples and submultiples are formed on the base of gram (g). (The distinction between mass and weight is subtle and not normally relevant to Digital business.)

For example:

$$\begin{array}{ll} \mu\text{g microgram} & \text{not nkg nano kilogram} \\ \text{mg milligram} & \text{not } \mu\text{kg micro kilogram} \end{array}$$

2.2.21 Values Less Than 1

Where a number less than 1 unit is to be represented, a 0 (zero) should precede the decimal point to lessen the likelihood that the decimal point is missed by the reader.

Example:

0.15 mA *not* .15 mA

NOTE

This usage should occur primarily in tables. See subhead 2.2.14.

2.2.22 Trade Sizes or Nominal Sizes

Do not attempt to convert "inch" trade sizes to metric dimensions or to convert "metric" trade sizes to inch dimensions. However, American trade sizes are generally meaningless outside of the U.S. (and sometimes Canada) just as metric trade sizes (or British trade sizes) are generally unobtainable inside the U.S. Thus, products that require customer-supplied material or connections or conformance with local material regulations must be designed to accept locally available trade sizes throughout the world.

Trade sizes or nominal sizes do not have any direct correlation to actual dimensions of the item being specified.

- For example, a (U.S.) 2 × 4 piece of lumber is not 2 inches by 4 inches in any dimension and, in fact, its dimensions are different depending on what its finish is (or its purpose), when it was manufactured (what year), and in what part of the country it was manufactured (or to which standards).
- U.S. screw sizes (designations) should not be converted to "metric" dimensions. Metric screw sizes (designations) should not be converted to "inch" dimensions. For example, a 6-32 UNC x 0.5 inch long screw becomes a 6-32 UNC x 12 mm long screw in metric. An M5-.8 x 10 mm long screw becomes an M5-.8 x 0.38 inch long screw in inch units.
- A 4' x 8' x 1/2" piece of plywood does indeed measure 4.00 feet by 8.00 feet by 0.500 inches to very close tolerances, but is not generally available outside of the U.S. and a few other countries.
- American (copper) wire gages (AWG) and metric wire sizes do not correspond. In general, any provision for customer- or field-installed wiring must accommodate a range of sizes specified in both AWG and metric wire sizes. See DEC STD 002-0 for further information.
- European pipe sizes are, in general, incompatible with American pipe sizes. American iron, copper, and plastic pipe size designations are purely trade sizes and, even though specified in inches, the sizes do not correspond to any measurable dimension. For example, a piece of 1/2-inch type M copper refrigeration tubing has different (incompatible) dimensions than a 1/2-inch rigid copper water pipe. A 4-inch iron drain (sewer) pipe has different (incompatible) dimensions than a 4-inch schedule 100 iron water supply pipe. A careful investigation or the provision of fittings that will accept a range of sizes is necessary for worldwide products.
- 35-mm film and 110 size film are made to the same standards throughout the world, so that no knowledge of the actual dimensions or conversion of units is needed or useful for most purposes.

- Sheet metal thicknesses shall be expressed in actual inch or millimetre dimensions rather than gage sizes. The same American or British gage in different metals have different thicknesses. In addition, a sheet metal designer must be aware that standard American sheet metal thicknesses are not readily available outside of North America and standard European sheet metal thicknesses are not readily available in the U.S. In addition, alloy composition, temper, and finish designations differ between U.S. (ASTM) and standards used elsewhere. See *DEC STD 048-0 Metallic Raw Material Selection and Identification* for additional information.
- A 19-inch EIA/RETMA relay rack for mounting standard electronic equipment has the same interface dimensions and hole spacings worldwide. (The maximum width of a panel is actually 19.00 inches or 48.26 mm.) However, the size of the screws (if any) for which the rack is tapped will vary even in the U.S. The use of clip-nuts which are installed as needed is necessary for worldwide products instead of tapped holes for a particular screw size.

2.2.23 Required Labeling

Various agencies of the U.S. and other governments have regulations about the quantity labeling of foodstuffs, drugs, and other consumer commodities. In general, regulations about quantity labeling and sizes of specific commodities do not, at the present time, affect Digital products or literature. See *DEC STD 178 Digital Identification Marking Requirements Manual* for labeling requirements.

2.2.24 Typesetting

Although historically there have been several units of size used for typesetting at various times in various parts of the world, the computer industry has settled on the most common unit, the point, even though this is a non-metric (and non-English) unit. One printer's point is slightly smaller than 1/72 inch. The worldwide computer standards take the point to be exactly 1/72 inch = 0.013889 inch = 0.35278 millimetre. See *DEC STD 074-9 Printer Systems Standard - Positioning Control Functions* for references.

Where necessary to distinguish between the two meanings of point, the unit measuring exactly 1/72 in. is referred to as a "computer point"; similarly exactly 1/7200 in. is referred to as a "computer centipoint".

"Point" is commonly abbreviated "pt." in both the printing and computer industry.

Thus we have

centipoint	= 0.01 point	= 138.9 microinches	= 3.53 micrometres
decipoint	= 0.1 point	= 1.389 millinches	= 35.3 micrometres
point	= 0.01389 in.	= 13.89 millinches	= 353 micrometres

2.2.25 Modifiers to Unit Symbols

In text, the attachment of letters to a unit symbol to give information about the quantity under consideration is incorrect. For example, using MWe for "megawatts electrical (power)" or Vac for "volts ac" is not acceptable. Therefore there is no SI equivalent to the units psia (pounds per square inch, absolute) or psig (pounds per square inch, gage; that is relative to the surroundings). Use instead text like "... at an absolute pressure of 13 kPa" or "... at a gage pressure of 13 kPa".

Where space limitations make it necessary to present information about the quantity being described with the unit symbol of the measurement, the information must be separated with a space and, as desired, a comma, parenthesis, or other device. Typical examples are headings of tables, nameplates, and graph labels.

For example:

rating: 120 V ac
kPa, gage
MW elec
kJ thermal

On the other hand, where letters are needed to *identify* the unit being used, the letters should be attached to the basic unit. No SI unit requires this treatment.

For example:

mmHg measures blood pressure, rather than length
ftH₂O measures gas pressure, rather than length
gal_{US} indicates U.S. rather than UK gallons
gal_{UK} indicates UK rather than U.S. gallons

3 LIST OF ABBREVIATIONS

The abbreviations in Tables 3 and 4 are listed alphabetically by name. The list is not complete but covers most cases of interest. Units seldom encountered at Digital are omitted. However, when clarity is not compromised, other unit symbols listed in ISO 1000, IEEE 260 or IEEE 268 or derivable from the principles enumerated in these standards are allowed.

All units intended for general usage that are listed in the directive are included in this list.

In the Notes column:

[SI] indicates that the unit and symbol are part of the SI system and are acceptable to the EEC.

[ok EEC] indicates that the unit and symbol are acceptable to the EEC, according to the directive noted under subhead 2.2.1.

[use OK] indicates that the unit and symbol are not the subject of the directive and can be used.

Only units and unit symbols are marked in this way. All non-unit abbreviations in the GEN column are acceptable.

In conversion factors:

"[SI] = 1.0 J/kg [SI]" indicates both the listed unit (gray) and the equivalent unit are SI units.

" = 745.7 W [SI]" indicates that only the equivalent unit (watt) is an SI unit. The listed unit (horsepower) is not an SI unit.

"[SI] = 57.296° indicates that only the listed unit (radian) is an SI unit. The equivalent unit (degree) is not an SI unit.

In general, conversion factors are provided only to facilitate conversion to SI units, not vice versa.

To convert a listed unit to the unit given in the Notes column, multiply by the conversion factor given in the Notes column.

3.1 GENERAL ABBREVIATIONS

The general abbreviations in the GEN column of the table are widely known in electrical engineering and related fields. Before using a particular abbreviation, carefully consider whether or not the reader is likely to be familiar with the abbreviation.

The preferred form of the abbreviation is shown. In general, consistency of use is more important than precise form.

The following units are allowed to be used as legal units of measurement in EEC countries only where they were authorized on 21 April 1973 and until a date to be fixed by each member state, often for particular purpose only: inch, foot, mile, yard, square foot, acre, square yard, fluid ounce, gill, pint, quart, gallon, ounce (avoirdupois), Troy ounce, pound, therm.

Units noted "EEC use to disappear not later than 1 October 1981" are no longer officially sanctioned for EEC use. Their actual status among our users is unknown.

GEN: General Term

LPT: Form printed by an (uppercase) computer output device when the abbreviation in the GEN column cannot be used.

3.2 BITS AND BYTES

The symbol b is recognized for bits in some standards (IEEE 260 but not ISO 1000). There is no recognized symbol for bytes. By defining the unit symbols in text before they are used or in a glossary, it is often acceptable to use "b" for bits and "B" for bytes (of defined size). You must be aware that B is also the symbol for "bel" as in dB for "decibel" and make sure that there is no conflict in your document. After defining these symbols in your document, you can also use combinations with other unit symbols and multipliers.

For example:

100 kb/s = 100 kilobits per second
245 B/mm = 245 bytes per millimetre

Table 3: Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
adjust	adj	ADJ	
alternating current	ac	AC	Standards differ; be consistent within a document. See also DEC STD 178-3, which requires that graphic symbols be used on equipment nameplates.
American Standard Code for Information Interchange	ASCII		ANSI X3.4-1986 and related standards.
American Standards Association	ANSI		Now American National Standards Institute
American Wire Gage	AWG		
ampere	A		[SI]
ampere-hour	A · h		[SI] = 3600 C [SI]
ampere-turn	At		= 1 A [SI]
amplitude modulation	AM		
analog to digital	A/D		
and	&		
approximate	approx		
atmosphere	atm		= 101 325 N/m ² [SI]
atomic mass unit (unified)	u		[ok EEC]
audio frequency	AF		
automatic frequency control	AFC		
automatic gain control	AGC		
automatic volume control	AVC		
average	avg		
bar	bar		[ok EEC] = 10 ⁵ Pa [SI]
baud	baud		[use OK]
beat frequency oscillator	BFO		
becquerel	Bq		[SI] = 1.000 s ⁻¹ [SI]; radioactivity
bel	B		[use OK]
billion electron volts			= 1.000 GeV [ok EEC]
binary coded decimal	BCD		
bits per inch	bits/in, b/in		= 0.3937 bits/mm [SI]
Note:	Where "bits per inch" occurs frequently, the abbreviation "b/in" may be used after being defined		
bits per millimetre	bits/mm, b/mm		[SI]
Note 1:	ISO magtape standards use the terminology rows/mm.		
Note 2:	Where "bits per millimetre" occurs frequently, the abbreviation "b/mm" may be used after being defined		

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
bits per second	bits/s		[SI]
Note:	In manuals where "bits per second" occurs frequently, the abbreviation "b/s" may be used, after being defined.		
British Thermal Unit ±0.1%	Btu	BTU	= 1055 J [SI]
British Thermal Unit per hour	Btu/hr		= 0.293 W [SI] = 1.055 kJ/h [SI]
bytes per second	B/s		
Note:	Where "bytes per second" occurs frequently, the abbreviation "B/s" can be used after being defined if there is no possibility of confusion with "bels per second", "B/s".		
calorie (gram calorie) (International table)	cal		= 4.1868 J [SI]
calorie (kilogram calorie, food calorie)	Cal		= 4.19 kJ [SI]
Note:	Do not use calorie in Digital documents.		
candela	cd		[SI]
candela per square foot	cd/ft ²		= 10.764 cd/m ² [SI]
candela per square metre	cd/m ²		[SI]
Note:	Candela per square foot and candela per square metre measure the intensity of an extended luminous source. See also lumen per square metre and lux.		
candle	cd		= 1.0 candela [SI]
cathode ray tube	CRT		
celsius	°C		Use degree celsius [SI]
centigrade	°C		Use degree celsius [SI]
centimetre	cm	CM	[SI] = 10.000 mm [SI]
Note:	Millimetre is preferred for mechanical drawings. Centimetre is widely used for site preparation drawings.		
character per second	char/s		
circular mil	cmil		= 5.0671 x 10 ⁻⁴ mm ² [SI]
continuous wave	CW		
coulomb	C		[SI]
cubic centimetre	cm ³	CU CM	[SI] = 1000 mm ³ [SI]
cubic foot	ft ³	CU FT or CF	= 0.028317 m ³ [SI]
cubic foot per minute	ft ³ /min		= 0.47195 L/s [SI]
cubic foot per second	ft ³ /s		= 28.317 l/s [SI]
cubic inch	in ³	CU IN	= 16.387 ml [SI]
cubic metre	m ³	CU M	[SI]
cubic metre per second	m ³ /s		[SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
cubic yard	yd ³	CU YD	= 0.7645 m ³ [SI]
cycle per second	c/s		Hertz preferred for frequency
decibel	dB	DB	[use OK]
decibel referred to one milliwatt	dBm	DBM	[use OK]
degree (angle)	...°	DEG	[ok EEC]
degree celsius	°C	DEG C	[SI]; formerly centigrade
degree fahrenheit	°F	DEG F	5/9(°F - 32) = °C [SI]
degree kelvin	K		= 1.000 kelvin [SI]
diameter	Ø		
	Note:	The symbol for diameter must be a circle with a diagonal line through it. A capital letter O is not acceptable.	
Digital Equipment Corporation	DEC TM		
	Note:	This is a trademark; see the Company Identity Manual for presenting this and other trademarks.	
digital to analog	D/A		
direct current	dc	DC	Standards differ; be consistent within a document. See also DEC STD 178-3, which requires that graphic symbols be used on equipment nameplates.
double pole double throw	DPDT		
double pole single throw	DPST		
dyne	dyn		= 10 ⁻⁵ N [SI]
earth	E		The "earth" or "safety ground" terminal on an IEC 320/CEE 22 or similar power connector, male or female. To be used with the symbols L and N (single phase). See DEC STD 002-0.
electron volt	eV		[ok EEC]
erg	erg		= 10 ⁻⁷ J [SI]
extended BCD interchange code	EBCDIC		
fahrenheit	°F	DEG FAHR	[SI] 9/5 °C + 32 = °F
farad	F		[SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
feet per minute	ft/min	FT PER MIN	= 5.08 mm/s [SI]
feet per second	ft/s		= 0.3048 m/s [SI]
field-effect transistor	FET		
fluid ounce	fl oz		= $28.41 \times 10^{-6} \text{ m}^3$ [SI]
foot	ft	FT	= 0.3048 m [SI]
foot candle	fc		= 10.764 lm/m^2 [SI]
footlambert	fl		= 3.426 cd/m^2 [SI]
foot per minute	ft/min	FT PER MIN	= 5.08 mm/s [SI]
foot per second	ft/s		= 0.3048 m/s [SI]
foot per second squared	ft/s ²		= 0.3048 m/s^2 [SI]
foot pound	ft · lbf		= $1.3558 \text{ N} \cdot \text{m}$ [SI]
foot poundal	ft · pdl		= $0.04214 \text{ N} \cdot \text{m}$ [SI]
Note:	The use of units involving the poundal is not recommended.		
foot pound force	ft · lbf		= $1.3558 \text{ N} \cdot \text{m}$ [SI]
frequency modulation	FM		
gallon (liquid)	gal		gal (U.S.) = 3.785 l [SI] gal (UK) = 4.546 l [SI]
gallon per minute	gal/min		U.S. = 0.0631 l/s [SI] UK = 0.07577 l/s [SI]
gauss	G		= 10^{-4} Wb/m^2 [SI] = 10^{-4} T [SI]
gigabits per second	Gb/s		
Note:	Where gigabits per second occurs frequently, the abbreviation "Gb/s" may be used after being defined.		
gigabytes	Gbytes, GB		
Note:	Where gigabytes occurs frequently, the abbreviation "GB" may be used after being defined.		
giga electron volt	GeV		[SI]; Formerly Bev
giga hertz	GHz		[SI]
gilbert	Gb		= 0.7958 ampere turn [SI]
gill	gill		= $0.1421 \times 10^{-3} \text{ m}^3$
Note:	The use of gill is not recommended.		
gon	gon		[SI] = $\pi/200$ radians [SI] = 0.0157 radians
grade	gon		[SI] = $\pi/200$ radians [SI]
gram	g	GM	[SI]
gravity (acceleration of, nominal)	g _n , G	G	= 9.8 m/s^2 [SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
	Note:	Use only in shock and vibration testing; no additional precision of the conversion is justified in this application.	
gray	Gy		[SI] = 1.0 J/kg [SI]; radioactivity absorbed dose
ground	GND		
henry	H		[SI]
hertz	Hz	HZ	[SI]; formerly cycle per second
horsepower (550 ft · lbf/s)	hp		= 745.7 W [SI]
hour	h		[SI]
	Note:	Time may be designated: 9 ^h 45 ^m 30 ^s	
inch	in	IN	= 25.400 mm [SI]
	Note:	In text, inch should be spelled out to avoid confusion with the preposition "in".	
inch of water (pressure)	-		= 249 N/m ² [SI] = 249 Pa [SI]
inch ounce	ozf · in		= 7.062 N · mm [SI]
inch per second	in/s		= 25.4 mm/s [SI]
inch pound	lbf · in		= 113 N·mm [SI]
intermediate frequency	IF		
joule	J		[SI] = 1 watt · second [SI]
joule per hour	J/h		[SI] = 2.778 x 10 ⁻⁴ W [SI]
kelvin	K		[SI] K = °C - 273.15
	Note:	kelvin (K) is recommended but degrees celsius (°C) is acceptable for designating differences in temperature. No degree sign (°) is used with K.	
kilobits per second	kb/s		
	Note:	Where kilobits per second occurs frequently, the abbreviation "kb/s" may be used after being defined.	
kilobytes	kbytes, kB		
kilobytes per second	kB/s		
	Note:	Note: Where kilobytes per second occurs frequently, the abbreviation "kB/s" may be used after being defined.	
kilo electron volt	keV		[SI]
kilo gauss	kG		= 1/10 tesla [SI]
kilogram	kg	KG	[SI]
	Note:	The kilogram is a measure of mass only. Use the newton as a measure of force.	
kilogram calorie*	Cal		= 4.187 kJ [SI]
kilogram calorie per hour*	Cal/h		= 1.163 W [SI] = 4.187 kJ/h [SI]
kilogram force*	kgf		= 9.80665 N [SI]
kilogram-metre*	kgf·m		= 9.80665 N · m [SI]
	Note:	Do not use the above terms (designated by an asterisk) in Digital documents.	
kilohertz	kHz		[SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
kilojoule	kJ		[SI]
kilojoule per hour	KJ/h		[SI] = 0.2778 W [SI]
Note:	This is the preferred unit for heat dissipation in Germany.		
kilohm (kilohm)	k Ω	KOHM	[SI]
kilometre	km	KM	[SI]
kilometre per hour	km/h		[SI]
kilovolt	kV		[SI]
kilovolt ampere	kVA	KVA	[SI]
kilowatt	kW		[SI] = 3600 kJ/h [SI] = 3.6 MJ/h [SI]
kilowatt hour	kW · h		= 3.60 × 10 ⁶ J [SI] (electrical energy consumption only)
knot	knot		= 0.514 m/s [SI]
lambert	L		= 3183 cd/m ² [SI]
line	L		The "line" or "hot" or "phase" terminal on an IEC 320/CEE 22 or similar single phase power connector, male or female. To be used with the symbols N and E. See DEC STD 002-0.
line per minute	line/min	LPM	[use OK]
liter, litre	l		[SI]
Note:	Either spelling is acceptable to the EEC. IEEE 268-1982 uses "L" for litre and its derivatives. ISO 1000 accepts either "l" or "L".		
liter per second	l/s		[SI]
logarithm (base 10)	log		
lumen	lm		[SI]
lumen per square foot	lm/ft ²		= 10.764 lm/m ² [SI]
lumen per square metre	lm/m ²		[SI]
lumen per watt	lm/W		[SI]
lumen second	lm · s		[SI]
lux	lx		[SI] = 1 lumen per square metre [SI]
maxwell	Mx		= 10 ⁻⁸ Weber [SI]
megabits per second	Mb/s		
Note:	Where megabits per second occurs frequently, the abbreviation "Mb/s" may be used after being defined.		
megabytes	Mbytes	MB	
Note:	Where megabytes occurs frequently, the abbreviation "MB" may be used after being defined.		
megabytes per second	Mbytes/s, MB/s		
Note:	Where megabytes per second occurs frequently, the abbreviation "MB/s" may be used after being defined.		
mega electron volt	MeV		[SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
megahertz	MHz	MHZ	[SI]; formerly mega-cycle per second
megavolt	MV		[SI]
megawatt	MW		[SI]
megohm	MΩ		[SI] = 10 ⁶ ohms [SI]
metal oxide silicon	MOS		
metre, meter	m	M	[SI] = 39.37 inches
Note:	Either spelling is acceptable to the EEC.		
mho	mho	MHO	= 1 siemens [SI]
microampere	μA	UA	[SI]
microfarad	μF	UF	[SI]
microgram	μg		[SI]
microhenry	μH	UH	[SI]
micrometre, micrometer	μm	UM	[SI]
micromho	μmho		= 1 μS [SI]
micron	μm		= 1 micro metre [SI]
microsecond	μs	USEC	[SI]
microsiemens	μS		[SI] = 1 micromho
microwatt	μW		[SI]
mil	mil	MIL	= 0.001 inch = 25.4 μm [SI]
mile (statute)	mi	MILE	= 1.609 km [SI]
mile (international nautical)	nmi		= 1.852 km [SI]
mile per hour	mi/h		= 0.447 m/s [SI] = 1.609 km/h [ok EEC]
milliampere	mA	MIL A	[SI]
millifarad	mF	MIL F	[SI] = 0.001 farad [SI] [SI] = 1000 μF [SI]
milligram	mg		[SI]
millihenry	mH	MIL H	[SI]
milliliter, millilitre	ml, mL		[SI]; See liter notes
millimetre, millimeter	mm	MIL M	[SI]; See metre note
"millimetre of mercury"	mmHg		= 133.322 N/m ² [SI]
Note 1:	Do not use "millimetre of mercury" in Digital documents.		
Note 2:	EEC use authorized only for blood pressure.		
millimicron	nm		= 1 nanometre [SI]
milliroentgen per hour	mR/h		= 71.67 pA/kg [SI]
millisecond	ms	MIL SEC	[SI]
millisiemens	mS		[SI] = 1 millimho
millivolt	mV	MIL V	[SI]
milliwatt	mW	MIL W	[SI]

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
minute (angle)	...'	MIN	[SI]
minute (time)	min	MIN	[SI] See also hour
miscellaneous	misc		
mole	mol		[SI]
nanoampere	nA	NA	[SI]
nanofarad	nF	NF	[SI] = 0.001 μ F [SI] = 1000 pF [SI]
nanometre, nanometer	nm		[SI]; formerly milli-micron
nanosecond	ns	NSEC	[SI]
nanowatt	nW		[SI]
nautical mile (international)	nmi		= 1.852 km [SI]
neper	Np		[use OK]
neutral	N		The "neutral" terminal on an IEC 320/CEE 12 or similar power connector, male or female. To be used with the symbols L and E. See DEC STD 002-0.
newton	N		[SI] = 1 kg · m/s ² [SI]
newton meter, newton metre	N · m		[SI]
not applicable	NA		
not available	NA		
numeric aperture	NA		optics, fiber optics
Note:	Ensure that the meaning of NA is clear from context or by defining it.		
oersted	Oe		= 79.58 amperes/metre [SI]
ohm	Ω	OHM	[SI]
ounce (avoirdupois)	oz	OZ	= 28.3495 g [SI]
ounce force	ozf		= 0.2780 N [SI]
ounce-inch	ozf · in		= 7.062 N.mm [SI]
pascal	Pa		[SI] = 1.000 N/m ² [SI]
per	/		[SI] (only with unit symbols)
Note:	Alternatively, raise the unit symbols to a negative power. The use of "p" for "per" is not acceptable.		
phase	R1		The first "line" or "phase" terminal on a CEE 17 or similar power connector, male or female.
	S2		The second "line" or "phase" terminal on a CEE 17 or a similar power connector, male or female.

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
	T3		The third "line" or "phase" terminal on a CEE 17 or similar power connector, male or female.

Note: The phase symbols R1, S2, and T3 are to be used together with N and $\underline{\underline{\perp}}$. See DEC STD 002-0.

picoampere per kilogram	pA/kg		[SI]; X-radiation exposure rate
picofarad	pF	PF	[SI]
picosecond	ps		[SI]
picowatt	pW		[SI]
pint (liquid)	pt	PT	U.S. = 0.473 l [SI] UK = 0.568 l [SI]
point (printer's)	pt		= 0.0138 inch = 350.5 μ m [SI]
point (computer's)	pt		= 1/72 inch = 0.01389 inch = 353 μ m [SI]
poise	P		= 10^{-1} Pa $\cdot$ s [SI]
	Note:	Do not use poise in Digital documents.	
positive	POS		
potentiometer	POT		
pound	lb	LB	= 0.45359 kg [SI]
poundal	pdl		= 0.13825 N [SI]
	Note:	The use of poundal is not recommended.	
pound force	lbf		= 4.4482 N [SI]
pound force foot	lbf $\cdot$ ft		= 1.3558 N $\cdot$ m [SI]
pound force per square inch	lbf/in ²	PSI	= 6895 N/m ² [SI]
quart (liquid)	qt	QT	U.S. = 0.946 l [SI]; UK = 1.1365 l [SI]
radian	rad		[SI] = $180/\pi$ degrees [SI] = 57.296°
radio frequency	RF		
revolution per minute	r/min		[ok EEC]
revolution per second	r/s		[ok EEC]
roentgen	R		= 2.58×10^{-4} C/kg [SI]; X-radiation total exposure
root mean square	rms		
rows per millimetre	rows/mm		[use OK]
second (angle)	..."	SEC	[SI]
second (time)	s	SEC	[SI]. See also hour.
	Note:	The use of "sec" as an abbreviation for a second of time is common but not sanctioned by any standard. Such use can be unacceptable to some authorities and could cause product rejection.	
siemens	S		[SI] = ohm ⁻¹
sievert	Sv		[SI] = 1.0 J/kg [SI]; equivalent radiation dose

Table 3 (Cont.): Abbreviations and Unit Symbols for General Use

Symbols or Words	GEN	LPT	Notes
silicon controlled rectifier	SCR		
single pole double throw	SPDT		
single pole single throw	SPST		
square foot	ft ²	SQ FT	= 0.092903 m ² [SI]
square inch	in ²	SQ IN	= 645.16 mm ² [SI]
square metre	m ²	SQ M	[SI]
square yard	yd ²		= 0.83613 m ² [SI]
standard	std	STD	"STD" is only used as part of a Digital standard title, such as "DEC STD 015-0".
steradian	sr		[SI]
stokes	St		= 10 ⁻⁴ m ² · s ⁻¹ [SI]
Note:	Do not use stokes in Digital documents.		
tesla	T		[SI] = 1 Wb/m ² [SI]
ton of refrigeration	none		= 12000 Btu/h = 3.517 kW [SI] = 12.7 MJ/h [SI]
tonne	t		[SI] = 1000 kg [SI]
torr			= 133.32 Pa [SI]
Note:	Do not use torr in Digital documents.		
transactions per second	TPS		(English only)
troy ounce	oz tr		= 31.10 g [SI]
Note:	Use of troy ounce not recommended at Digital.		
unified atomic mass unit	u		[ok EEC]
U.S. standard code for information interchange	ASCII		= American Standard Code for Information Interchange
volt	V		[SI]
volt ampere	VA		[SI]
volt ampere reactive	var		[SI]
watt	W		[SI] = 3.6 kJ/h [SI]
watt hour	Wh		[SI]
watt per steradian	W/sr		[SI]
weber	Wb		[SI] = 1 V·s [SI]
yard	yd	YD	= 0.9144 m [SI]

3.3 FABRICATION AND MATERIAL ABBREVIATIONS

These abbreviations are local to the United States and in some cases unique to Digital. Their use should be limited to mechanical drawings not intended for use by customers, computer users, or general engineering and scientific readers.

These abbreviations are in all capital letters in conformance with simplified drafting practices. Some include periods. In some cases, they are in conflict with usual general engineering and scientific practices. These abbreviations are not intended for use in publications, block schematics or engineering specifications, except mechanical procedure specifications.

Table 4: Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
acceptable quality level	AQL	
adapter	ADPT	
addendum	ADD	Only on gear drawings and specifications
addition	ADD	
adhesive	ADH	
adjust	ADJ	
advance	ADV	
alloy	ALY	
alternate	ALT	
aluminum	AL	
ambient	AMB	
American Standards Association	ASA	Now American National Standards Institute
American Wire Gage	AWG	
amount	AMT	
anneal	ANL	
anodize	ANOD	
application	APPL	
approved	APPD	
approximate	APPROX	
as required	A/R	
assemble	ASSEM	
assembly	ASSY	
association	ASSN	
authorize	AUTH	
automatic	AUTO	
auxiliary	AUX	
average	AVG	
balance	BAL	
ball bearing	BB	
baseline	BL	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
basic	BSC	Only in dimensioning
bearing	BRG	
beryllium	BE	
between	BET	
bevel	BEV	
bill of materials	B/M, BOM	
black	BLK	
blue	BLU	
bolt circle	BC	
bonding	BOND	
both faces	BF	
both sides	BS	
bottom	BOT	
bracket	BRKT	
brass	BRS	
braze	BRA	
breaker	BKR	
Brinell Hardness	BH	
broach	BRO	
bronze	BRZ	
brown	BRN	
bushing	BUSH.	
by (dimensions)	X	
cabinet	CAB	
cadmium	CAD	
calibrate	CAL	
capacitor	CAP	
cap screw	CAP SCR	
carbon	CAR	
carbon steel	CS	
carborize	CARB	
case harden	CH	
casting	CSTG	
castle nut	CAS NUT	
cast iron	CI	
catalog	CAT	
cathode	CATH	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
center center line	CTR CL, 	Use CL only when there is no possibility of confusion with "clearance".
center to center	C to C	
ceramic	CER	
chamfer	CHAM	
change	CHG	
chassis	CHAS	
check	CHK	
chromium	CR	
circuit	CKT	
circuit breaker	CKT BKR	
circular	CIR	
circular pitch	CP	
circumference	CIRC	
classification	CLASS	
clearance	CL	
clockwise	CW	
coaxial	COAX	
coefficient	COEF	
cold-drawn steel	CDS	
cold-rolled steel	CRS	
column	COL	
combination	COMB	
commercial	COML	
concentric	CONC	
conductor	COND	
connector	CONN	
construction	CONSTR	
continue(d)	CONT	
coordinate	COORD	
copper	CU	
corrosion resistant steel	CRES	
counter bore	CBORE	
counter clockwise	CCW	
counter drill	CDRILL	
counter sink	CSK	
coupling	CPLG	
crystal	XTAL	
cubic foot per minute	CFM	= 0.47195 L/s [SI]
cutout	CO	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
cyanide	CYN	
cylindrical	CYL	
dedendum	DED	Only on gear drawings and specifications
deep drawn	DD	
deep, depth	D	
degree (angle)	DEG	
department	DEPT	
detail	DET	
diagonal	DIAG	
diameter	DIA	
dimension	DIM	
direct current	DC	
disassembly	DISASSY	
double	DBL	
dowel	DWL	
drafting	DFTG	
drawing	DWG	
drawn	DR, DRN	
drill	DR	
each	EA	
elongation	ELONG	
engineer	ENG	
engineering	ENGRG	
engineering change order	ECO	
equipment	EQUIP	
equivalent	EQUIV	
estimated	EST	
expanded, expansion	EXP	
external	EXT	
extrude	EXTR	
external pipe thread	EPT	
fabricate	FAB	
facing	FCG	
far side	FS	
feet per minute	FPM	= 5.08 mm/s [SI]
feet per second	FPS	= 0.3048 m/s [SI]
figure	FIG	
fillet	FIL	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
fillister head	FILL HD	
finish	FIN.	
finish all over	FAO	
fixture	FIX	
flat head	FL HD	
foot	FT	= 0.3048 m [SI]
foot per minute	FPM	= 5.08 mm/s [SI]
foot pound	FT LB	= 1.3558 N · m [SI]
forging	FORG	
forward	FWD	
foundry	FDRY	
frame	FR	
free cutting brass	FCB	
gallon per minute	GPM	U.S. = 0.0631 L/s [SI] UK = 0.07577 L/s [SI]
gasket	GSKT	
gray, grey	GY	
green	GRN	
hard drawn	HD	
harden	HDN	
harden and grind	H&G	
hardware	HDW	
head	HD	
heat treat	HT TR	
hexagonal	HEX	
hexagonal head	HEX HD	
horizontal	HORIZ	
horsepower (550 ft · lbf/s)	HP	= 745.7 W [SI]
hot rolled steel	HRS	
housing	HSG	
identification	IDENT	
impregnate	IMPG	
inch	IN.	= 25.400 mm [SI]
information	INFO	
inside diameter	ID	
inspect	INSP	
internal	INT	
installation	INSTL	
internal pipe thread	IPT	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
key seat	KST	
keyway	KWY	
kilogram	KG	
Note: The kilogram is a measure of mass only. Use the newton as a measure of force.		
laminate	LAM	
left	L	
left hand	LH	
letter	LTR	
limit	LIM	
linear	LIN	
lockwasher	LW	
long	LG	
lubricate	LUB	
machine	MACH	
magnetic	MAG	
maintenance	MAINT	
manufacture(d)	MFG	
material	MATL	
maximum	MAX	
mechanical	MECH	
medium	MED	
mil	MIL	= 0.001 inch = 25.4 μ m [SI]
minimum	MIN	
minute (angle)	MIN	
minute (time)	MIN	
miscellaneous	MISC	
modified, modification	MOD	
mold line	ML	Castings only
mounting	MTG	
mounted	MTD	
national coarse (thread)	NC	
national extra fine (thread)	NEF	
national fine (thread)	NF	
national special (thread)	NS	
national taper pipe (thread)	NTP	
near side	NS	
nominal	NOM	
normally closed	NC	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
normally open	NO	
not applicable	NA	
number	NO	
obsolete	OBS	
optional	OPT	
orange	ORN	
outside diameter	OD	
package	PKG	
pair	PR	
parallel	PAR.	
part number	PN	
parting line	PL, $\overline{R}$	Castings only.
passivate	PASS.	
pattern	PATT	Castings only
perpendicular	PERP	
phillips head	PHL HD	
phosphor bronze	PH BRZ	
photograph	PHOTO	
pickled and oiled	P & O	
pitch	P	Gear drawings only
pitch circle	PC	Gear drawings only
pitch diameter	PD	Gear drawings only
point	PT	
power supply	PS	
printed circuit	PC	
preliminary	PRELIM	
purple	PUR	
quality control	QC	
quantity	QTY	
radius	R or RAD	
receptacle	RECP	
reference	REF	
relay	RLY	
required	REQD	
revision	REV	
revolution per minute	RPM	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
right	R	
right hand	RH	
round	RND	
round head	RND HD	
schedule	SCHED	
schematic	SCHEM	
screw	SCR	
second (angle)	SEC	
second (time)	SEC	
section	SECT	
serial number	SER NO	
set screw	S SCR	
sheet	SH	
shield	SHLD	
similar	SIM	
socket	SOC	
socket head	SOC HD	
spacer	SPR	
specification	SPEC	
spring	SPG	
square	SQ	
square foot	SQ FT	= 0.092903 m ² [SI]
square inch	SQ IN	= 645.16 mm ² [SI]
stainless steel	SST	
stiffener	STIFF	
stranded	STRD	
symbol	SYM	
symmetrical	SYM	
tangent	TAN	
teletypewriter	TTY	
temperature	TEMP	
terminal	TERM	
thick	THK	
thread	THD	
three phase	3 PH	
tolerance	TOL	
total indicator reading	TIR	
transformer	XFMR	
true position	TP	

Table 4 (Cont.): Internal Use Abbreviations for Mechanical Specifications

Symbols or Words	Mech	Notes
tubing	TUB	
twisted	TW	
twisted pair	TWP	
typical	TYP	
unified national coarse (thread)	UNC	
unified national extra fine (thread)	UNEF	
unified national fine (thread)	UNF	
unified national special (thread)	UNS	
variable	VAR	
vertical	VERT	
violet	VIO	
washer	WASH	
weight	WT	
white	WHT	
wide, width	W	
wire-wound	WW	
with	W/	
without	W/O	
yard	YD	= 0.9144 m [SI]
yellow	YEL	

APPENDIX A INTERNATIONAL LABELING REQUIREMENTS

Abstracted from *Metric Laws and Practices in International Trade - A Handbook for U.S. Exporters*, U.S. Department of Commerce, September, 1976. A revision of this document was published in 1982. Neither version is currently available.
Dual labeling is allowed in all cases, except where noted.

Country	Status	Comment
Argentina	SI required	
Australia	SI required	
Austria	SI used	no specific requirement
Belgium*	SI required	
Brazil	SI used	no specific requirement
Canada	SI being implemented	dual labeling required in French and English
Denmark*	SI required	
EEC countries	SI required (on a schedule)	Imperial units also required in UK and Ireland until (perhaps) 1995
Finland	SI required	dual labeling recommended
France*	SI (or CGS) required	
Federal Republic of Germany*	SI required	
Greece	SI required	dual labeling preferred
Hong Kong	SI being implemented	no specific requirement
India	SI required	shipping documents must show SI units
Indonesia	SI used	dual labeling preferred
Iran	SI used	no requirements (1976); expected by 1979
Ireland*	SI being implemented	dual labeling required in SI and Imperial units
Italy*	SI required	
Japan	SI required	dual labeling allowed, except for foodstuffs
Luxembourg*	SI required	
Mexico	SI required	
Netherlands*	SI used	
New Zealand	SI being implemented	dual labeling allowed in SI and Imperial or U.S. units
Nigeria	SI required	SI only allowed, not dual
Norway	SI used	
Peru	SI used	
Philippines	SI being implemented	
Singapore	SI being implemented	shipping documents must include SI units

* = EEC (European Economic Community) member countries.

Country	Status	Comment
South Africa	SI being implemented	dual labeling allowed for computer equipment
Spain*	SI used	shipping documents must include SI units
Sweden	SI used	
Switzerland	SI used	import and customs documents must specify at least SI units
Taiwan (Republic of China)	SI required	
Thailand	SI used	Thai script required
Turkey	SI used	no specific requirement
United Kingdom*	SI being implemented	dual labeling required
United States	U.S. units used	dual labeling allowed
Venezuela	SI used	SI only allowed, not dual; import documents must show SI units

* = EEC (European Economic Community) member countries.

**APPENDIX B OJ NO. L 357/28 7.12.89 89/617/EEC OFFICIAL
JOURNAL OF THE EUROPEAN COMMUNITIES, COUNCIL
DIRECTIVE OF 27 NOVEMBER 1989 AMENDING DIRECTIVE
80/181/EEC, PORTIONS OF THE DIRECTIVE AS AMENDED**

"Article 1"

"The legal units of measurement within the meaning of this Directive which must be used for expressing quantities shall be:

"(a) those defined in Chapter I of the Annex;"

These are shown as "(SI)" or "(ok EEC)" in subhead 3.1.

"(b) those listed in Chapter II of the Annex only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those States";

These are indicated as "EEC use to disappear ..." in subhead 3.1.

"(c) those listed in Chapter III of the Annex only in those Member States where they were authorized on 21 April 1973 and until a date fixed by those Member States. This date may not be later than 31 December 1994;"

These are noted at the top of subhead 3.1.

"(d) those listed in Chapter IV of the Annex only in those Member States where they were authorized on 21 April 1973 and until a date to be fixed by those states. This date may not be later than 31 December 1999."

Chapter IV is titled "Legal units of Measurement referred to in Article I(d), permitted in specialized fields only" and includes the fathom for marine navigation; the pint (Imperial, not US), fluid ounce, and gill for drinks; the ounce (avoirdupois) and pound for goods sold in bulk; and the therm for gas supply. These units are acceptable without metric equivalents only in particular countries, only for the stated purposes in these countries, and only until each country replaces their use with sanctioned units. Primarily, these units are used in the UK and Ireland only.

"Article 2"

- "(a) The obligations arising under Article 1 relate to measuring instruments used, measurements made, and indications of quantity expressed in units of measurement, for economic, public health, public safety or administrative purposes."
- "(b) This directive shall not affect the use in the field of air and sea transport and rail traffic of units, other than those made compulsory by the Directive, which have been laid down in international conventions or agreements binding the Community or the Member States."

"Article 3"

- "1. For the purposes of this Directive, "supplementary indication" means one or more indications of quantity expressed in units of measurement not contained in Chapter I of the Annex accompanying an indication of quantity expressed in a unit contained in that Chapter."
- "2. The use of supplementary indications shall be authorized until 31 December 1999."
- These "supplementary indications" are the dual or triple units of measurement referred to in subhead 2.2.5.
- "3. However, Member States may require that measuring instruments bear indications of quantity in a single legal unit of measurement."
- "4. The indication expressed in a unit of measurement listed in Chapter I shall predominate. In particular, the indications expressed in units of measurement not listed in Chapter I shall be expressed in characters not larger than those of the corresponding indication in units listed in Chapter I."

"Article 4"

- "The use of units of measurement which are not or are no longer legal shall be authorized for:
- " - products and equipment already on the market and/or in service on the date on which this Directive is adopted,
- " - components and parts of products and of equipment necessary to supplement or replace components or parts of the above products and equipment.
- "However, the use of legal units of measure may be required for the indicators of measuring instruments."

"Article 5"

"International standard ISO 2955 of 15 May 1983, Information Processing - Representations of SI and Other Units For Use In Systems With Limited Character Sets, shall apply in the field covered by paragraph 1 thereof."

"Article 6"

"Directive 71/354/EEC shall be repealed on 1 October 1981.

"Article 7"

"(a) Member States shall adopt and publish before 1 July 1981 the laws, regulations and administrative provisions necessary to comply with this Directive and shall inform the commission thereof."

"They shall apply these provisions from 1 October 1981."

APPENDIX C REFERENCED DOCUMENTS

C.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00002-00	<i>DEC STD 002-0 AC Power Wiring, Safety Earth Grounding, Plugs and Receptacle Information and Requirements</i>
EL-00012-01	<i>DEC STD 012-1 Documentation Identification Conventions Including Mnemonic Codes</i>
EL-00048-00	<i>DEC STD 048-0 Metallic Raw Material Selection and Identification</i>
EL-00074-09	<i>DEC STD 074-9 Printer Systems Standard - Positioning Control Functions</i>
EL-00114-01	<i>DEC STD 114-1 Engineering Drawing Requirements - Dimensioning and Tolerancing for Engineering Drawings</i>
EL-00169-00	<i>DEC STD 169-0 DEC Standard Coded Graphic Character Sets for Hardware and Software</i>
EL-00178-03	<i>DEC STD 178-3 Digital Marking Requirements for Completed Products Intended to Be Sold</i>
EL-00178-04	<i>DEC STD 178-4 Shipping Container Marking Requirements for Finished Goods</i>
EL-00178-05	<i>DEC STD 178-5 Marking Symbolology</i>
EL-00182-00	<i>DEC STD 182-0 Engineering Documentation Acceptance Criteria</i>
EL-00197-00	<i>DEC STD 197-0 Legal Requirements and Guidelines for Digital Publications and Software</i>
EL-SM056-00	<i>Logic Symbolology Manual</i>
EL-SM178-00	<i>DEC STD 178 Digital Identification Marking Requirements Manual</i>

Use VTX SMC to order copies of EL-class documents from Standards and Methods Control. Send distribution questions to JOKUR::SMC or call DTN: 234-4423.

C.2 Other Digital Documents

Document Number	Document Title
.	<i>Company Identity Manual (Digital Equipment Corporation)</i>

C.3 Other Documents

Document Number	Document Title
.	<i>National ZIP Code and Post Office Directory - (no order number)</i>
ANSI X3.4 - 1986	<i>American National Standard Code for Information Interchange</i>
ANSI/IEEE 260-1978	<i>IEEE Standard Letter Symbols for Units of Measurement</i>
ANSI/IEEE 268-1982	<i>IEEE Standard Metric Practice</i>

Document Number	Document Title
IEC 27 (1983-1989)	<i>Letter symbols to be used in electrical technology</i>
IEC PUBLICATION 417	<i>Graphic Symbols for Use on Equipment (including supplement)</i>
IEC STD PUB 309	<i>Parts 1 and 2: Plugs, Socket-Outlets, and Couplers for Industrial Purposes</i>
ISO 1000-1981	<i>SI units and recommendations for use of their multiples and certain other units</i>
ISO 2955-1974	<i>Information Processing - Representations of SI and Other Units</i>
ISO HANDBOOK 2	<i>Units of Measurement</i>

OJ No. L 39/40 ff 15.2.81 Directive 80/181/EEC	Official Journal of the European Communities, Council Directive of 20 December 1979 on the approximation of the laws of the Member States relating to units of measurement and on the repeal of Directive 71/354/EEC
OJ No. L 2/11 ff 3.1.85 Directive 85/1/EEC	Official Journal of the European Communities, Council Directive of 18 December 1984 amending Directive 80/181/EEC on the approximation of the laws of the Member States relating to units of measurement.
OJ No. L 357/28 7.12.89 Directive 89/617/EEC	Official Journal of the European Communities, Council Directive of 27 November 1989 amending Directive 80/181/EEC on the approximation of the laws of the Member States relating to units of measurement.

C.4 Ordering Information

Following are the sources for documents not available from Standards and Methods Control.

- ANSI, IEC, and ISO Documents

In the USA:

American National Standards Institute (ANSI),
1430 Broadway, New York, NY 10018,
Telephone (212) 642-4900

In other countries:

The national standards organization.

- National ZIP Code and Post Office Directory

In the USA:

Any non-contract post office.

- Company Identity Manual

Corporate Identity Group
PKO3-1/M88
DTN: 223-2459

- Official Journal of the European Communities documents

Copies of these publications (in various languages) are available from the Office of Official Publications of the European Communities, Boîte postale 1003, Luxembourg, or from various agencies of the individual EEC countries.

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